SCIENCE.

FRIDAY, AUGUST 15, 1884.

COMMENT AND CRITICISM.

A MARKED feature of recent scientific work is the tendency to international co-operation. Problems too large to be undertaken by a single institution, or even by one nation, are thus successfully solved. Two examples suggest themselves. The first of these is the largest piece of astronomical work yet undertaken. Since 1870 a dozen observatories have been actively engaged in preparing a catalogue of about a hundred thousand stars in the northern hemisphere, a part of the sky being assigned to each observatory. The Greely expedition recalls the second example. This was one of a dozen expeditions fitted out by various governments to secure simultaneous meteorological observations for one year at different points within the arctic circle. Other examples might be added, all tending to show that co-operation is likely to yield results of lasting value.

We have on several occasions called attention editorially, or through our contributors, to the advantages likely to follow the organization of an international scientific association properly formed; and the responses which have come to a recent appeal are to-day referred to in our notes. Besides the inspiration the individual members would gain from attendance at its sessions, such a society would inspire great confidence in the work that it might undertake. It would then become comparatively easy to secure proper means for investigation. Observers, too, would be much more willing to aid in a research in which there was little danger of needless duplication.

A CORRESPONDENT calls our attention to the omission of the Henry Draper medal in our brief list of honors founded in this country for scientific research. Both this and the Watson medal were overlooked; as we were under the impression that the gifts of Mrs. Draper and Professor Watson were wholly in aid of, rather than as rewards for, research. This last is the case in part with the Watson fund, the income of which is directed to be expended 'for the promotion of astronomical science.' But in making the National academy of sciences his residuary legatee, Mr. Watson also provided that a gold medal of the value of one hundred dollars, with a further gratuity of one hundred dollars, should be given "from time to time to the person in any country who shall make any astronomical discovery, or produce any astronomical work, worthy of reward, and contributing to our science." The fund is of recent date, and no award of the medal has yet been made; but a part of the expenses of the eclipse expedition to Caroline Island was paid from the fund.

The fund given by Mrs. Draper to the national academy, to commemorate one of its members, the late Dr. Henry Draper, is also very recent, and no award has yet been made. A gold medal of the value of two hundred dollars is to be awarded, not oftener than every two years, 'to any person in the United States of America, or elsewhere' (with preference, other things being equal, to an American), 'who shall make an original investigation in astronomical physics' meriting such an award. This award, like the Lawrence Smith medal, can be given only for investigations made or published since the last preceding award.

One is tempted to speculate on the comparative value of funds given in direct aid of scientific research, and of medals or gratuities rewarding successful discovery or searching investigation. The former, as the endowment of research, must surely produce the more immediate practical results; while the latter signalize the victories of science, and, when properly administered, direct public attention to what is of true value. But in the probable

extension of such foundations as the latter in this generous country, does there not lurk a possible danger, — a danger that their bestowal will fall into hands incapable of proper administration? If any one think this danger remote, let him reflect on the ill-judged selection of recipients for honorary degrees in many of our best universities and colleges. Let such foundations remain, as now, in the hands of those whose position has been gained solely by research, and the danger vanishes.

THE standard of light adopted by the Paris electrical conference last April is the amount of light emitted by a square centimetre of melted surface of platinum at the point of solidification. It was believed that advantage could thus be taken of a physical constant (namely, the melting-point of platinum) upon which could be based all our present changing and unsatisfactory photometric standards. The adoption of this standard has been much criticised, for it does not seem to lend itself easily to actual photometric tests. Werner Siemens proposes that a piece of platinum foil should be enclosed in a cavity provided with a conical opening 0.1 of a square centimetre; this piece of platinum to make part of an electrical circuit, the current in which can be so regulated that a comparison with any light can be made at the moment of fusion. The temperatures of solidification and fusion of platinum do not differ sensibly from each other, and Siemens believes that the error introduced by taking the temperature of fusion instead of that of solidification would be small. The use of an electrical current to produce fusion has certain advantages, for the time of fusion can evidently be deferred until the proper moment. Preliminary experiments have shown that the light emitted from an opening 0.1 of a square centimetre in section by Siemens's method is equivalent to nearly one and a half standard English candles.

Although the standard adopted by the Paris conference seems to be based upon the unalterable laws of matter, it does not seem as if it would ever be practically adopted. Some form of the modern incandescent electric light, it seems to us, would afford a much better prospect of a standard light. It is difficult to maintain the steadiness of such a light for photometric purposes; but this does not seem impossible to accomplish. It is evident, that, if we could maintain an electrical current constant through a platinum wire or carbon filament in a suitable medium, we should have the means of reproducing the same amount of heat, and therefore light, from the same area. Unfortunately, carbon changes in resistance at the point of incandescence; and the resistance of platinum is not invariable under repeated heating and cooling in a comparative vacuum. An exhaustive investigation of the peculiarities of platinum or of iridium, under the effect of incandescence produced by the electrical current, would seem to be desirable before the French standard is accepted as a finality.

LETTER TO THE EDITOR.

Tornado predictions.

IN an article on 'Tornado predictions,' published in the July number of the *American meteorological journal*, a table of verifications is given, in which the average of successful predictions for several months is from ninety-six to ninety-eight per cent.

An examination of the table shows that this remarkably high percentage of verification is largely made up, *not* of successful predictions of tornadoes, but of successful predictions of no tornadoes. In justification of this method of verification, the writer says, "It requires as much and often more study to say that no tornadoes will occur, as to make the prediction that conditions are favorable for their development." If this explanation be accepted as satisfactory, what do the verifications signify?

A little consideration will show that the *absolute* value of these figures gives no basis from which to judge of the real success of the tornado predictions. The averages of ninety-six and ninety-eight per cent are mainly functions of the non-tornado days, with but slight modifications for the success or failure of the prediction of actual tornadoes. An ignoramus in tornado studies can predict no tornadoes for a whole season, and obtain an average of fully ninety-five per cent. The value of the expert work must, therefore, be measured by the excess which is obtained over the man who knows nothing of the subject. This is the only way to determine any significance in the method of verification above described. The excess is but one or two per cent, and poorly exhibits the present stage of progress in tornado studies. The injustice which is done is to be found in the method of verification adopted. In ascertaining the value of tornado or any other special storm predictions, the consideration of days on which no storms occur, and none are predicted, is entirely beside the question.

If the writer of 'Tornado predictions' will give the verifications obtained from positive predictions, and

the occurrence of actual tornadoes, his measure of success will be directly apparent. G.

THE NATIONAL CONFERENCE OF ELECTRICIANS.

THE president of the United States, in pursuance of a special provision of congress, has appointed a scientific commission, the composition of which we gave in No. 78, of which Professor Rowland is chairman, and which may, in the name of the United-States government, conduct a national conference of electricians in Philadelphia in the autumn of 1884. The law creating the commission is as follows: "That the president of the United States be, and is hereby, authorized to appoint a scientific commission which may, in the name of the United-States government, conduct a national conference of electricians in Philadelphia in the autumn of 1884; that said commission may invite scientific men, native and foreign, to participate in the conference, and may, in general, determine the scope and character of its work; that the sum of seven thousand five hundred dollars be appropriated to meet the expenses of the commission in conducting the conference and investigations, and to meet the expenses of preparing reports of the same, *provided* that the whole amount of the expenses incurred by said commission shall not exceed the said sum of seven thousand five hundred dollars, and the members of said commission shall not receive any compensation for services." It is left to the discretion of the commission to invite foreign scientific men to join in the labors of the conference; and the United-States government does not dictate in regard to the topics which are to be treated in the conferences, further than to require that the first meeting shall be held as early as Aug. 7, 1884. In the letter to each member of the commission, apprising him of his appointment, Secretary Frelinghuysen writes, "It is hardly necessary to observe that this commission, appointed for high scientific purposes, will not permit its influences to be exerted in behalf of any person or company, manufacturers of electrical apparatus or machines."

The *raison d'être* of this commission is the conjunction of the electrical exposition in Philadelphia with the meeting of the American association of science in the same place, and the meeting of the British association in Montreal. It is hoped that a number of foreign scientific men may be induced to deliberate with the American commission upon more or less international electrical questions. It is thought by some that there is hardly need of another conference of electricians. The French conference has lately adjourned. Lord Rayleigh has made an exhaustive determination of the ohm. A standard of light has been adopted which is the best that present experience indicates. The meteorological directions of electrical science need time, and not conferences, for their development; and the protection of international cables and international telegraphic relations was fully considered in the French conference. In answer to this view, it must be pointed out that the mere assemblage of those most interested and practised in any department of science is necessary in the present state of scientific research. There are no 'gentle hermits' in the subject of electricity; and no one can hope to advance the subject by working in a remote lighthouse or on a desert island. There may be Victor Hugos in poetry and fiction, but not in electricity.

It is possible that American science may enlighten foreign science, even on such trite subjects as the ohm and the standard of light. There is, moreover, the adoption of the electric light by the American lighthouses, and a report upon the uses of electricity in connection with torpedo warfare, — a subject, when it is considered that torpedoes constitute our principal means of harbor defence, of especial interest in the coming presidential election. The imagination needs only a slight stimulation to perceive that the government can reasonably expect as great a return for the sum of seven thousand five hundred dollars invested in an electrical conference, as it can hope to have from the same sum expended in improving the harbor of Podunk.

THE HARVARD PHYSIOLOGICAL LABORATORY.

The physiological laboratory of the medical school of Harvard university presents some peculiarities of arrangement and appointments which seem worthy of a brief description. The rooms occupied for this purpose include about one-fourth of the available space of the second floor in the new building of the school at the corner of Boylston and Exeter Streets in Boston. The disposition of these rooms is shown in the accompanying plans (figs. 1 and 2). The large lecture-room, it will be seen, has also an ante-room leading to the chemical laboratories, which occupy the remainder of the floor, the lectures of both departments being given in this room. It may be mentioned here that the stories of the building are in general quite high, permitting the frequent use of mezzanines with great economy of space.

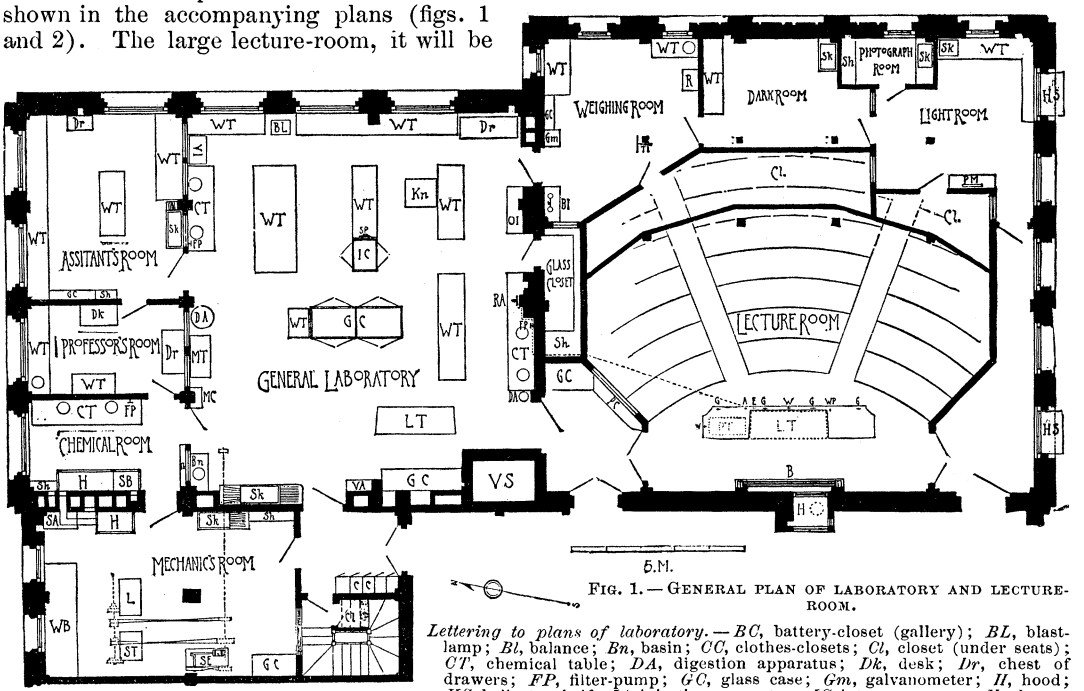


Fig. 1. — General plan of laboratory and lecture-room.

Lettering to plans of laboratory. — *BC*, battery-closet (gallery); *BL*, blast-lamp; *Bl*, balance; *Bn*, basin; *CC*, clothes-closets; *Cl*, closet (under seats); *CT*, chemical table; *DA*, digestion apparatus; *Dk*, desk; *Dr*, chest of drawers; *FP*, filter-pump; *GC*, glass case; *Gm*, galvanometer; *H*, hood; *HS*, heliostat shelf; *IA*, injection apparatus; *IC*, interrupter case; *Kn*, kymographion; *L*, lathe; *LT*, lecture-table; *MC*, meat-cutter; *MT*, mercury-table; *OI*, operating instruments; *PC*, portfolio-case; *PM*, pendulum myograph; *R*, refrigerator; *RA*, respiration apparatus; *SA*, soldering apparatus; *SB*, steam-bath; *SE*, steam-engine; *Sh*, shelves; *Sk*, sink; *SP*, seconds pendulum; *ST*, saw-table; *Tl*, telescope; *VA*, varnishing apparatus; *VS*, ventilating shaft; *WB*, work-bench; *WT*, working-table. *Lecture-room.* — *A*, air-blast; *B*, blackboards; *E*, electricity; *G*, gas; *PT*, pneumatic trough; *W*, water; *WP*, waste-pipe.

In the lecture-room itself the table is the most interesting feature. When ready for use, it is merely a plain black walnut table, with a thick top about 5 metres long, 90 centimetres wide, and 86 centimetres above the floor. On this are water and gas cocks (*W*, *G*), and a waste-pipe (*WP*), to which the overflow from any apparatus may be conducted. This pipe runs into a small open sink lying below that portion of the table, and having also its own water-supply. Near the middle of the table are the binding-posts of a pair of electric wires (*E*) coming from the general laboratory, and close to these is the air-pipe (*A*) from the respiration apparatus, to be presently described. The course of the wires and pipe beneath the floor is shown by a dotted line in the plan. At the same end of the table is a movable cover over a large pneumatic trough. Here, as elsewhere on the table, the water-supply is from a tank at the top of the building, so that the pressure is constant. As the pipes are independent, the necessary conditions of the water-supply for hydraulic experiments are satisfied. The middle half of the table presents more novel features. It is movable, running on wheels, and exists in duplicate, each of the two departments using the lecture-room being thus provided for. This section can be run off into the laboratory, and there loaded with any apparatus or material required for the lecture. It is thus possible to

prepare a difficult experiment much more readily and completely, or to leave complicated apparatus set up for some length of time. The section has also a set of drawers containing such operating instruments, glassware, towels, etc., as are constantly required in the demonstrations, a shelf below carrying sand-baths, lamps, and the like. In the plan the movable table (*LT*) stands in the laboratory, as when waiting for its lecture-load. Behind the table in the lecture-room are three sliding blackboards (*B*), 280 centimetres long and 120 centimetres wide, which run up and down in front of a small hood (*H*), communicating also with the adjoining chemical laboratory. In this way unpleasant smells or noxious gases are easily avoided; and apparatus may be set up while the lecture is going on. Along the upper edge of each blackboard is a small brass rod, which has been found convenient for suspending diagrams and tables. Below are cupboards for further lecture-supplies, four electric bells being placed at the side to summon various persons whose help may be required during the lecture. The seats slope upward with a gradually increasing pitch (in accordance with the rule of construction given by Lachez), so that each person in the audience has an equally good opportunity of seeing over the heads of those in front of him.[1] Above the seats is a broad platform or gallery leading to the entrances for students, and corresponding to the mezzanine of the floor. At the back of this gallery the windows are provided with shelves for such microscopical demonstrations as the lectures require. The room is lighted almost entirely from windows in the eastern and southern gallery; but, as the lectures for which the room was planned are usually delivered in the morning, no difficulty has arisen. A large chandelier has been found sufficient for the later hours of the winter afternoons and in the evening. A beam of light may be brought into the lecture-room by placing a heliostat on the shelf (*HS*) of the proper window in the southern wall of the building, and this ray can also be carried into the laboratory. At present no arrangements have been made to darken the lecture-room for lantern demonstrations; but this can be easily done, should it become desirable.

A small ante-room at the side opens both into the main hall and the general laboratory. The latter is a large room (10.8 by 9.6 metres) and of the full height (6.25 metres) of the story. Light is furnished by three large windows in the eastern wall, and by the five windows of the gallery at the northern end (see fig. 2). As the partition-wall which shuts off the small rooms is partly of glass, the light-supply is ample. A general view of this room and of the gallery, taken from a point near the door of the weighing-room, is given in fig. 3. The arrangement of the working-tables (*WT*) is evident from the plan. Those along the walls are firmly fixed in position, as is also the middle table adjoining the interrupter-case (*IC*): the other working-tables can be moved as required. Two chemical tables (*CT*), with the necessary shelves and chemicals, bowls, and filter-pumps, furnish places for from six to eight students in the practical courses or for special work. The working-tables adjoining the kymographion (*Kn*) and interrupter-case (*IC*) can be extended to the long table below the windows by a board, which is hooked into position as needed. In this way it is possible for two persons to operate in the most favorable light and position. The cases holding the operating instruments (*OI*) will be seen to be very conveniently placed against the wall near the operating-table: at the side are shelves containing the ether, morphia, curare, etc., likely to be required.

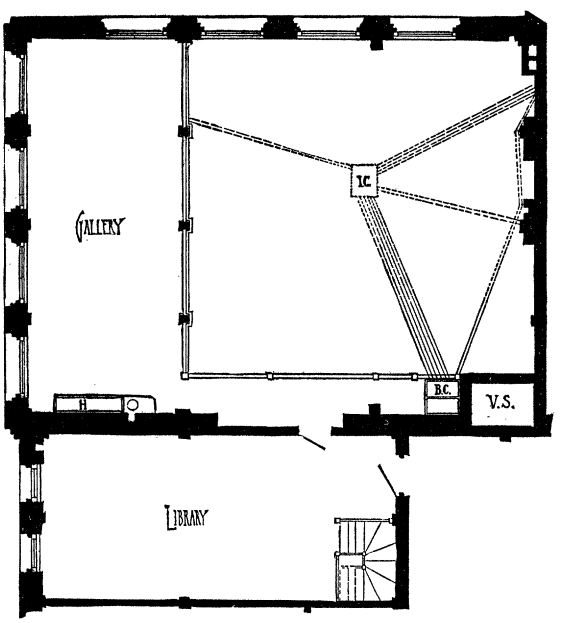


FIG. 2. — HALF STORY.

The ventilation of this room, like that of the

[1] See Czermak: Ueber das physiologische privat-laboratorium an der Universität Leipzig. 1873.

building in general, is provided for by large shafts in the wall, which, however, for the sake of simplicity, are not fully indicated in the plan. There are similar shafts for warming the rooms with heated air. There are also numerous steam-radiators for the coldest weather. Besides the waste-pipes belonging to the sinks and bowls, shown in the plan, there are many extra waste-pipes with stop-cocks, to which, by means of hose, water may be carried off from

of place here. It is intended to serve primarily as a laboratory of research, and secondarily as an adjunct to the lectures on physiology in the preparation of suitable apparatus and experiments. Courses in 'practical physiology' are also given in the laboratory to the class in sections of a convenient size, but no instruction in 'biology' is contemplated. All histological work proper is carried on in a special department in another part of the build-

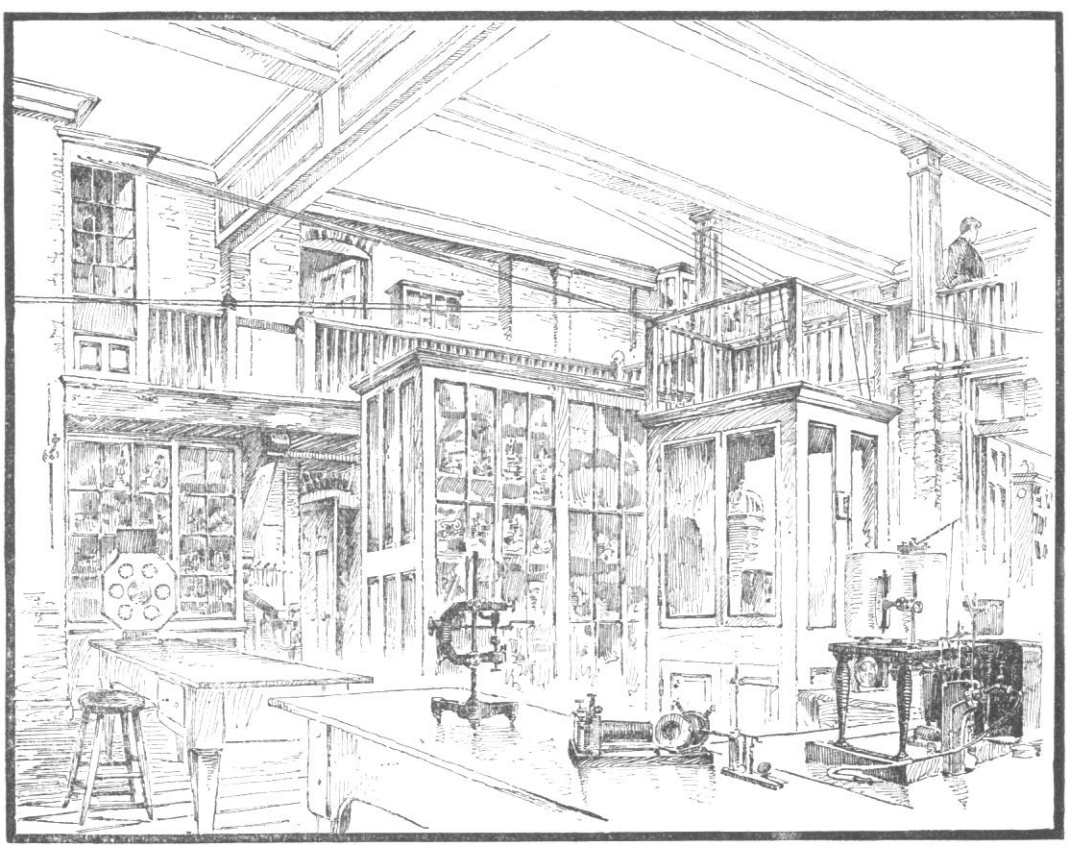


FIG. 3. — INTERIOR OF GENERAL LABORATORY.

any apparatus which can possibly be set up in any of the rooms. The sink in the north-western corner of the laboratory and the adjacent basin (*Bn*) have both hot and cold water. With one exception, the water-supply comes directly from the ordinary city pipes. The exception is the chemical table against the southern wall, which has an independent supply from the tank already mentioned, and therefore useful for hydraulic experiments.

To avoid any misapprehension, a word as to the purpose of this laboratory may not be out

ing. It seems desirable to mention these things more particularly, lest any one should miss those features which are prominent in some American laboratories of recent date.

The centre of the room is occupied by a large double case (*GC*), with glass doors on both sides, intended to hold such pieces of apparatus as are used in laboratory-work. Another glass case at the side of the room to the west serves the same purpose, while that in the little ante-room contains such special apparatus and preparations as are used regularly

in the lectures. Alongside the latter is a portfolio case (*PC*) for the diagrams and drawings required in the same courses. Near the large case in the laboratory is the structure familiarly known as the 'tower,' but called the interrupter-case (*IC*) in the plan, which has been found to be a great convenience. A view of the upper portion of the tower is given in fig. 4, the lower part being merely a large closet for wire and other supplies. Its purpose is to hold various pieces of apparatus for interrupting or regulating the galvanic current. As a rule, all the batteries made use of in the laboratory are set up as required in the battery-closet in the gallery, and connected with wires running to the tower, whence the current is conducted to the apparatus, or to wires running into the rooms where electricity may be needed, as well as to the lecture-table. The general relation of the wires to the battery-room and the tower is shown in the plan of the gallery (fig. 2). A special line of very large copper wires is also shown, which goes directly, without a break, to the remoter work-rooms. This line has been found necessary for the battery required to work a large Ruhmkorff coil at that distance. The present system of wires has been planned chiefly to meet the demands of ordinary work, but is capable of such extension as may be required. Outside the tower hangs the seconds pendulum (*SP*), which is heavy enough to swing for about half an hour. It can be put in any circuit, and thus give very exact time or regular interruption in any room of the department. In the tower itself the only pieces of apparatus considered permanencies are those seen in fig. 4, — a clock and a new interrupter, recently imported from Leipzig. The latter rather complicated instrument seen on the left of the figure has valuable features; the platinum contacts being under alcohol or petroleum, and so arranged that either the closing or opening induced current may be short-circuited. The rapidity of the shocks can be considerably varied within the limits of thirty in one second, and one in thirty seconds. This apparatus was constructed by Baltzar. In principle it is the same as that described by Bohr, in his article, "Ueber den einfluss der tetanisirenden irritamente auf form und grösse der tetanus curve" (*Arch. anat. u. physiol., physiol. abth.*, 1882, p. 233). Many changes have, however, been made in the details before the present form was arrived at. In this a metallic cylinder turned by clock-work carries two sets of pegs (like the pins in a musical box), which strike against levers, and thus break contacts in the trough below. The pins of each series are so set that the contact is broken in one lever a little sooner than in the other, and consequently is still broken in the latter when the former closes. In this way a simple change of the wires from the induction apparatus permits the short-circuiting of the opening or the closing induction shock at pleasure. By an ingenious arrangement a cog-wheel can be shifted so as to give the cylinder a very slow or a rapid motion, as desired: the series of pegs thus do double work, and permit the great range of interruptions already mentioned.

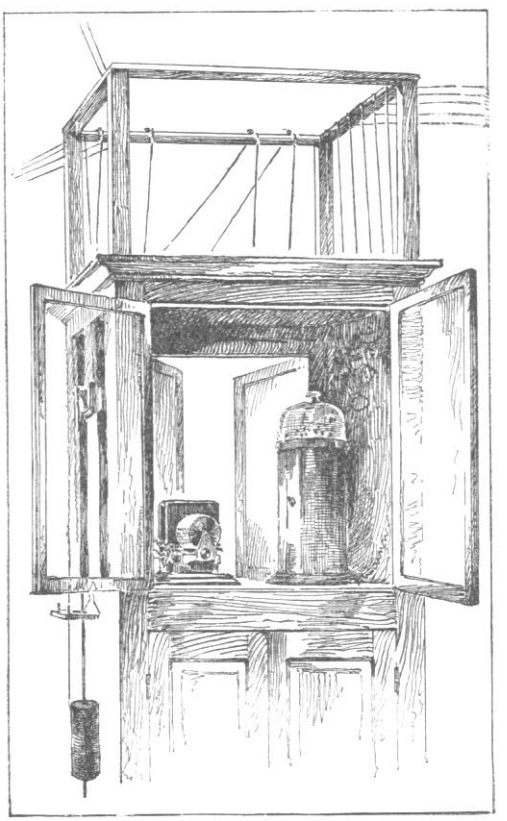


FIG. 4. — INTERRUPTER-CASE.

The clock, seen on the right of the figure, has a revolving pendulum, and a set of toothed wheels, which interrupt the electric current at intervals of one, two, three, four, five, ten, fifteen, twenty, thirty, or sixty seconds. The duration of the interruptions may be any thing less than four seconds. By using a relay these may be changed into closures of corresponding length and interval. This clock was con-

structed by Zachariae of Leipzig, and has been described by Dr. Bowditch in his communication, "Ueber die eigenthümlichkeiten der reizbarkeit, welche die muskelfasern des herzens zeigen" (*Ber. sächs. gesellsch. wiss. Leipzig*, xxiii. 1871, 658).

Besides the more ordinary forms of interrupter in common use, the laboratory possesses several home-made ones, which have proved useful, and are set up in the interrupter-case as required. One is merely a simplified Bernstein's acoustic interrupter, in which a steel bar of variable length (determined by a sliding clamp) is kept swinging by a temporary magnet above, while a platinum point makes and breaks in a cup of mercury below. Another very simple and inexpensive form, which is easily made, and probably admits of more general application, consists of a steel rod swinging on a knife-edge at one end, while the other is attached to a long spiral spring fixed above. The swing is determined by the tension of the spring, and the position of variable weights on the bar. This arrangement has proved useful for slow interruptions, one to three in a second, the apparatus before mentioned permitting four to ninety in the second.

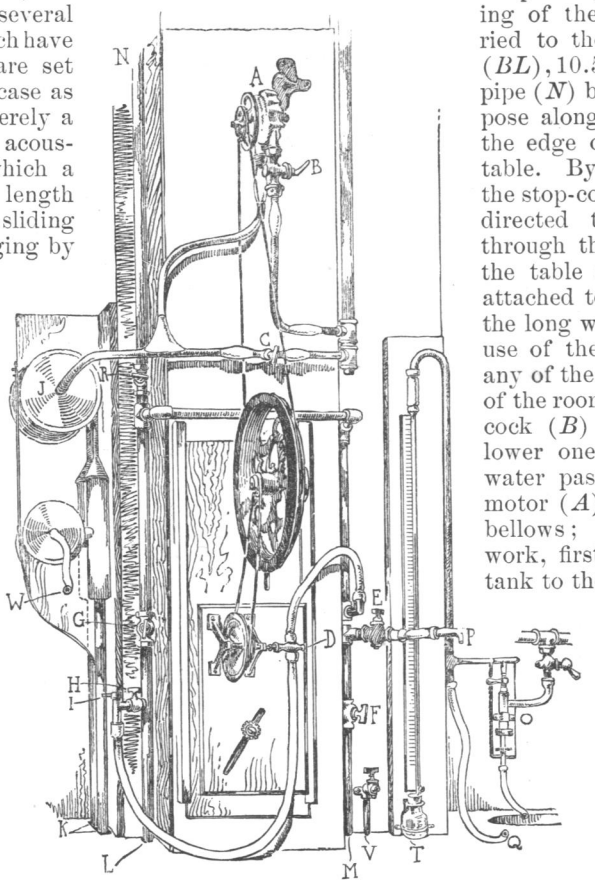


Fig. 5. — Respiration apparatus.

Lettering to respiration apparatus. — *A*, water-motor; *BC*, stop-cocks for water-supply; *D*, revolving stop-cock; *EFGHR*, stop-cocks directing stream of air; *I*, regulating-cap; *JKW*, water-bellows; *L*, air-supply from bellows; *M*, pipe to lecture-room; *N*, pipe to working-tables; *O*, filter-pump; *P*, air-pipe for blast-lamp; *Q*, rubber pipe of filter-pump; *T*, mercury-gauge; *V*, gas for blast-lamp; *W*, air-inlet to bellows.

Against the wall, above the end of the chemical table on the southern side of the room, is the respiration apparatus (*RA*), whose construction is made clearer by the adjoining sketch (fig. 5). It is merely a water-bellows of the ordinary form, receiving its water-supply by the upper pipe at the right, from the constant-pressure tank at the top of the building. The water enters the upper cylinder (*J*), and passes down through the pipes marked *K*, into the air-chamber in the basement two stories below, the compressed air coming up to the laboratory by the pipe *L*. If the water enter the bellows by the lower stop-cock (*C*), a steady blast of air is obtained, which may work a blast-lamp at *P*, or, by a proper closing of the stop-cocks, be carried to the glass-blowing table (*BL*), 10.5 metres away; a gas-pipe (*N*) being laid for this purpose along the wall, and under the edge of the long working-table. By a different closure of the stop-cocks, the air-stream is directed to the lecture-room through the pipe *M*, reaching the table at *A*. Rubber hose attached to a stop-cock below the long wall-table permits the use of the same blast of air on any of the other working-tables of the room. If the upper stop-cock (*B*) be opened, and the lower one (*C*) be closed, the water passes through a small motor (*A*) before entering the bellows; thus doing double work, first in falling from the tank to the motor, and then in falling further to the basement. The motor gives motion to the cone below, and a small stop-cock in the axis at *D* regularly breaks the otherwise constant stream of air, which, opening the stop-cock *H*, and closing that at *G*, permits free passage to this portion of the apparatus. A slotted cap (*I*) regulates the amount of air delivered, while the rapidity of the interruptions can be nicely adjusted by the amount of water flowing through the motor, and by the size of the wheel used on the cone. Another combination of high pressure and slow movement can be obtained by so adjusting the stop-cocks *B* and *C* that more or less water enters the bellows without passing through the motor. The large wheel and the cone are on sliding boards, so that

the tension of the belts may be readily regulated. This form of stop-cock was arranged some years ago by Dr. Bowditch, to be run by the clock-work of the kymographion, and has been described by him in the *Journal of physiology* (ii. 3, p. 202). This interrupted blast of air is carried by the pipes already mentioned to any table where it is required. The system was planned for the present needs of laboratory-work, but could be readily extended even to other work-rooms. It has thus far proved quite satisfactory, and readily adaptable to the artificial respiration of dogs, cats, or rabbits.

Adjoining the respiration apparatus, the sketch shows a filter-pump (*O*) and its simple mercury-gauge (*T*), which can be attached to the same system of piping, and used at a distance. This is done by connecting the rubber tube *Q* with the pipe *P*. Although the system was not originally planned for use with negative air-pressures (the revolving stop-cock not being quite tight enough for such a purpose), it is very easy to produce a negative pressure of two hundred and forty millimetres (mercury) on the table in the lecture-room, or on the more remote working-tables of the general laboratory.

At the other end of the room is a small mercury-table (*MT*). This is merely an ordinary table, with a raised edge, made tight and thoroughly varnished. A little shelf at one corner holds a bottle to catch the refuse mercury directed to a hole in this corner by a suitable shortening of the legs. A firm shelf on the pilaster near by holds a small meat-cutter (*MC*), and a press for extracting meat-juice and the like. At the other side of the mercury-table stands the large digestion apparatus (*DA*), or constant temperature box. This consists of two cylindrical boxes of sheet-copper of different sizes, joined by a rim at the top, and resting on legs made of iron rods. The inner box has a diameter of forty centimetres and a depth of twenty-nine centimetres, the corresponding dimensions of the outer casing being fifty-eight and thirty-eight centimetres respectively. The rim has two holes for corks carrying a thermometer and a glass tube of the regulator. At the side is a stop-cock for removing the water which fills the space between the two shells. The inner box is the air-chamber, and has a double-walled cover packed with charcoal. An extra cover has also been made, a thick wooden rim carrying two plates of glass, with an air-space between, so that any changes going on in the chamber kept at a constant temperature may be followed without removing the cover. The apparatus stands thirty centimetres above the floor, and, being covered with a layer of asbestos packing two centimetres thick, it parts with its heat so slowly that a single Bunsen burner suffices to keep it at a temperature of 60° C. The size of flame is determined by a glycerine regulator. A large glass tube suspended in the water contains the glycerine, which also fills a rubber tube communicating on a shelf above with the regulator, and ending in a small funnel. The glycerine, as the water warms, expands, and rises into the funnel, until, at the desired temperature, a stop-cock is closed. After this any further expansion forces a rubber membrane against the end of the gas-pipe above, and shuts off the main gas-supply to the flame, leaving only a small amount regulated by another stop-cock, the 'pin-hole' of the ordinary mercury regulators. The contraction of the glycerine, on cooling, draws the membrane down again, and thus increases the gas-supply. This regulator has been found very trustworthy; and the temperature of the air-chamber has remained quite constant for weeks at a time, with only a very small flame. Only temperatures from 38° to 60° C. have been tested, but for these the variation has not exceeded half a degree C. As the volume of water to be heated is large, about sixty-four litres, considerable time is required to raise the temperature sufficiently; and this is the only practical objection to the apparatus. This is, of course, compensated for by the size of the air-chamber, rather over thirty-six litres. For experiments calling for speed, there is a small digestion apparatus at the table near the lecture-room. This is merely a water-bath, with an ordinary mercury regulator, and a water-supply from a Mariotte's flask on the shelf at the back. For lecture demonstrations of artificial digestion, the laboratory has another piece of movable apparatus of convenient size and some elegance.

Adjoining the glass case on the western wall is the varnishing apparatus (*VA*). This is a simple tin trough, slightly tipped at one end, where a rubber pipe runs to a supply-bottle, whose position on the shelves at the side determines the filling or emptying of the trough. The smoked papers are run through the varnish, and then suspended from rods, to drip into the trough, and thus into the bottle. This form of apparatus was originally devised by Professor Kronecker of Berlin.

In the north-eastern corner of the laboratory, adjoining the chemical table, stands a large and convenient injection apparatus (*IA*) for the

preparation of animals or organs for microscopic work. It is merely a copper box, used as a water-bath, big enough to hold a large cat and several bottles of injection-material. Pressure is obtained by letting water from the tap run into a large bottle below the table. The compressed air then forces the injection-mass into the body, every thing being kept at a suitable temperature by a lamp below. By using T-tubes several vessels may be injected with different substances at the same time. On a small table by itself, but at the side of one of the working-tables, is the kymographion (*Kn*). This is of the Ludwig pattern, with a long roll of paper. It has special wires from the tower and from the pendulum. Over the kymographion is a large cover of painted cloth, stretched on a light wooden frame. By aid of a pulley in the ceiling, this cover is raised or lowered as required. A similar cover hangs above the table adjoining the pendulum, and an extra one is on hand to be placed where needed. The use of these dust-proof protectors makes it possible to keep complicated or delicate apparatus together for an experiment of indefinite duration, and safe from all ordinary disturbance when work is not going on.

To the north the main laboratory opens directly into two small rooms of less height, half-stories in fact, — the chemical room and that of the assistant. Between the two is the small private room of the professor. This contains working-tables, with water and gas, and can be conveniently used for private work. The assistant's room has also a long work-table especially arranged, as regards light and height, for microscopical work; and the room is, in fact, partly occupied at present for the preparation of material for histological demonstrations. This arrangement was made for the economical use of the animal supplies of the department. Another large table is intended for the examination of curves and records. There are also all the conveniences in the way of gas, water, waste-pipes, and electrical wires, needed to make the room convenient for private work. The chemical room has a large work-table, with numerous drawers to hold the more delicate glass apparatus. There are also the necessary shelves for chemicals and reagents. At the side of the commodious hood is a steam-bath, which has proved a great convenience. The fittings of the room, and the apparatus, are merely such as are required for ordinary physiological work, the nearness of the chemical laboratory on the same floor making a larger room for this purpose unnecessary.

The chemical room opens directly into the workshop of the laboratory, where the instruments are cared for and repaired, and where not a little even of the more delicate apparatus can be made. This room has its own sink and hood for such work as may be unpleasant to the nose, or otherwise irritating. A large and convenient work-bench occupies nearly all the northern end of the room. More in the centre of the room are the lathe (*L*) and saw-table (*ST*), each capable of receiving motion from the little steam-engine (*SE*), of about two and a half horse-power. This receives steam from the same pipes which come to the steam-bath already mentioned. The shafting at present runs only a few feet into the main laboratory, but can be readily extended as occasion shall require.

At the chief entrance of the main laboratory and the mechanic's room is a small ante-room with clothes-closets (*CC*) for those regularly working in the department. This room also opens upon the staircase leading to the room above, and to the 'gallery' of the general laboratory, these forming the mezzanine of this portion of the floor. Their arrangement is seen in the second plan (fig. 2). This space has been left more or less open with a view to its future adaptation to such needs as shall arise. A portion of that over the mechanic's room will probably soon be shut off by a glass partition, to make a quiet reading-room which will hold the working-library of the department. The larger space over the small rooms has its own hood and a water-supply, and is well provided with gas. During the past year, extended experiments in bacilliculture have been carried on here. A part is soon to be fitted up with large plain tables for the courses in practical physiology, which are given for the students of the first year in as large sections as can be conveniently managed. It would be easy at any time to make this space into several separate rooms, should they be required.

At the end of the gallery proper, along the wall to the west, is the battery-closet (*BC*). This opens into its own ventilating-shaft, and has two large soapstone sinks, in one of which the battery plates and cups are washed, the other serving to hold the porous cups kept constantly under water. On shelves at the side are large bottles with glass stop-cocks to hold the acids and other solutions. A glass case near by contains such battery-material as is not in frequent use, or fails to find room in the large storage-drawers below the closet. Should such a necessity arise, a broad gallery could also be built along the southern wall of the large room.

The door in the middle of this southern wall on the main floor opens into a large closet, a store-room for glassware. The remaining door leads to a set of smaller rooms under the gallery of the lecture-room, intended for special work, and to be more fully fitted up at some future time, or as the needs of investigation shall make desirable.

Under the seats and openings into two of these small rooms are closets, dotted in the plan, which are convenient places for storage. The first of these rooms is known as the 'weighing-room.' It contains a delicate balance (*Bl*) on a firm shelf, and a Wiedemann's galvanometer (*Gm*) fixed on a pier near the door. The telescope (*Tl*) of the latter is attached to a column in the centre of the room. In the corner is a small refrigerator (*R*) with a waste-pipe. This room, as well as its neighbors, has water, gas, and wires from the tower. The next, or 'dark room,' has no windows, and is intended for optical experiments, or for any work requiring the exclusion or perfect control of daylight. A shutter near the door to the south permits any arrangement of diaphragms and lenses which can possibly be called for. At some future time a Thomson galvanometer will be set up in this room.

The corner room, known as the 'light-room,' has no special purpose, but is to be used for such work as may require a very good light and perfect quiet. The position of this room, in the corner of the building farthest removed from the streets, is very favorable for uninterrupted, quiet investigation. In one corner is the 'photograph-room' for the preparation and development of the plates. Against the wall, in the opposite corner, a pendulum myograph (*PM*) is fastened permanently in position, and covered by a dust-proof case. This is the instrument made by Dr. J. J. Putnam, and described by him in the *Journal of physiology* (ii. p. 206). Wires run from this apparatus to the adjoining closet,—an arrangement that is found convenient for experiments with reaction time. One of the southern windows of the light-room has also a broad heliostat shelf (*HS*) outside, so that a beam of light may be sent even into the assistant's room, or, by a suitable disposition of mirrors, into any part of any other room. The remaining door of the light-room opens upon a passage-way which leads to the chemical laboratories, and makes the departments independent of the main hall or the lecture-room for communication.

KRAKATOA.

THE more the information accumulates with regard to the eruption of Krakatoa on Aug. 27, 1883, the more this phenomenon proves to have been remarkable and unique as a series of violent explosions.

From *Nature* of July 17 we learn, that, at the meeting of the Meteorological society of Mauritius on May 22, several interesting communications were made with regard to this eruption; among others, a letter from a M. Lecomte, dated at Diego Garcia (latitude 7° 20′ south, longitude 72° 35′ east of Greenwich) on April 24, describing how at breakfast, on the morning of Aug. 27, they had heard detonations, low but violent, and, attributing them to a vessel in distress, had run, and had sent men, to different points of the shore of the island, who were unable to see any thing to cause such sounds; also how the captain and mate of the Eva Joshua, just leaving Pointe de l'Est to anchor at Pointe Marianne (these places I cannot find, but suppose, from the account, that they are near Diego Garcia), had heard the same detonations, and sent men to the mast-heads, without seeing any thing. These, with the previous reports from Rodriguez, showed that in three distinct cases the sounds of the Krakatoa explosions were plainly heard at distances of at least twenty-two hundred miles, and, in the case of Rodriguez, of nearly three thousand.

It will be remembered, that in *Nature*, May 1, it was stated by Herr R. D. M. Verbeek that these sounds were heard in Ceylon, Burmah, Manila, New Guinea, and at Perth on the west coast of Australia, and, in fact, at all places within a radius of about 30°, or two thousand miles. But these later reports from Rodriguez and Diego Garcia show, that across the waters of the Indian Ocean, with no land intervening, they were carried distinctly to much greater distances.

The still more remarkable atmospheric gravity-waves which travelled round and round the globe in all directions from the Straits of Sunda, and which were fortunately registered on the self-recording pressure-guage of the large gasometer at Batavia, close by Krakatoa, were also registered on the barograms at Mauritius; and here there were distinctly recorded four successive transits of the waves from east to west, and three from west to east, the same as shown by Gen. Strachey to have occurred at some of the European stations. But, what is still more remarkable, there is a faint trace of a *fifth* transit of the waves from east to west on the morning of Sept. 2; i.e., *more than six days after the explosions*, and when the waves had travelled *more than four times round the earth*, or about a hundred and two thousand miles. The most sensitive barograph at the signal-office in Washington also shows small waves, which are probably the record, also, of this fifth transit (and barely possibly of the succeeding *sixth* transit of the same): but the phenomena at Washington are complicated by the fact that it is within about 33° of the antipodes of Krakatoa, and that the waves have different velocities east and west,

and also that the great circle through Krakatoa and Washington passes nearly over the poles, and in this direction the velocity seems to be still smaller; so that the phenomena for this region become more and more complicated for each succeeding transit, and, after the first two or three in each direction, rather difficult to unravel. Unfortunately, the other few barographs in use on this side the Atlantic — to all of which the great circles from Krakatoa take an entirely different direction from that to all the eastern stations — are not so sensitive as the best Washington barograph, and do not help much beyond the first two transits of the waves in each direction.

It is noteworthy that these barometric disturbances were first noticed at Mauritius early in September, soon after their occurrence, and were at once independently attributed to the Krakatoa eruption, but were supposed to be due to successive series of explosions day after day, until the publication long after, in *Nature*, Dec. 20, of the discovery of Mr. Scott and Gen. Strachey, showed them to be due to a single series of waves, travelling round and round the globe, from the explosions of Aug. 27.

Perhaps the most interesting and important fact appearing from these Mauritius records, in connection with these waves, is the difference in time of transit round the earth, as compared with that deduced from the European stations by Gen. Strachey. The paths of the waves from Krakatoa to the latter stations are, on the average, something like 40° north of west (from Krakatoa), and, to Mauritius, about 20° south of west; so that the great circles make an angle of about 60°. The difference in time of transit on these circles, and in the two directions on each, are best shown in the table below, where, following Gen. Strachey's nomenclature, the successive waves are numbered from i. to vii., and the odd numbers denote the transits from east to west, and the even those from west to east.

	i. to iii.	iii. to v.	v. to vii.	Mean.	ii. to iv.	iv. to vi.	Mean.
	S. E. to N. W.				N. W. to S. E.		
European . . .	*h. m.* 37 4	*h. m.* 36 54	*h. m.* 36 48	*h. m.* 36 57	*h. m.* 35 24	*h. m.* 35 9	*h. m.* 35 17
	N. E. to S. W.				S. W. to N. E.		
Mauritius . . .	*h. m.* 34 34	*h. m.* 34 37	*h. m.* 34 43	*h. m.* 34 38	*h. m.* 35 15	*h. m.* 36 13	*h. m.* 35 44

Of course, all the above numbers are liable to an uncertainty of several minutes; but, even when this is considered, the differences are quite marked. While the average time of transit *via* Europe is 1m. - 40m. *greater* going west than going east, *viâ* Mauritius it is 1h. 6m. *less;* indicating, as far as atmospheric currents are concerned, an opposite effect on these two great circles, which make, roughly, an angle of 60° with each other. The peculiar progression in the individual periods for successive transits can hardly be wholly accidental, and is in opposite directions; the waves *viâ* Europe going (in each direction) faster and faster, and *viâ* Mauritius being retarded. Perhaps the most striking difference is, that the mean period, regardless of direction, is nearly 1 h. less *viâ* Mauritius than *viâ* Europe, — a fact most strikingly shown by taking the whole interval vii.–i., which, for the five European stations where vii. was traced, gives 110 h. 50 m., and, for Mauritius, 103 h. 54 m.; showing the wave to have gone three times round the earth *seven hours quicker viâ* the more equatorial route, which is probably partly due to the higher temperature of the atmosphere along this path, and also, perhaps, to the fact that this great circle passes over about as little land as any that can be drawn through Krakatoa.

These facts show more forcibly how complicated the phenomena must have been near the antipodes of Krakatoa, and also at the latter place, upon the returns of the waves there. It is evident, that, when the Krakatoa committee of the Royal society shall have collected all the data, many interesting problems will arise in connection with these atmospheric waves; and, in connection with the distribution of Krakatoa dust by the upper currents (which, it may now be regarded as pretty well settled, was the cause of the wide-spread red-sunset phenomena), the explosive eruption of Krakatoa promises, if thoroughly investigated, to teach us more about the circulation of our atmosphere than years of ordinary meteorological study could have done. H. M. PAUL.

Washington, July 29.

OVERWORK IN GERMAN SCHOOLS.

AFTER forty-two years' experience, it is now virtually conceded in Germany that physical exercise is not a sufficient antidote to brain-pressure, but that where the evil exists, the remedy must be sought in the removal of the cause.

Official action with reference to over-pressure has been taken in Prussia, Saxony, Würtemberg, Baden, Hesse, and Alsace Lorraine. In each instance it is based upon the report of a commission of inquiry, consisting of school directors, and members of school boards, as well as physicians.

The official action based upon the reports of the commissions is embodied in decrees dealing with the scope and method of teaching, the number and hours of study in school, and the amount of home-study.

The Hessian government issued decrees about home-study in 1877, and again in 1881. Complaints of overwork increasing, a commission was appointed to make further investigation, and report in full. Their recommendations were, in the main, embodied in the decrees of Feb. 23, 1883. By these decrees a maximum of home-study was fixed for each class, amounting for the lowest classes to an hour a day; the quantity of Latin and Greek required was diminished; and all tests of the student's progress that

necessitate much reviewing were forbidden. It was expressly ordered that the day and hour for test-exercises "shall not be announced to students more than twenty-four hours before they take place."

The Saxon decrees dated March 4 and 10, 1882, give particular directions as to the scope and methods of instruction, leaving the matter of study-hours untouched. They set forth that instruction in the classical languages is carried to excess in the gymnasia, being in many cases turned into teaching philology as a profession instead of being conducted as a means of general intellectual training. With reference to the '*extemporalia*' that form a prominent exercise in many of the Saxon gymnasia, the decrees are very pronounced. These essays which the students are required to translate and write down in a foreign language from dictation, are often, it is asserted, mere collections of questions in syntax, calculated to produce in the student "a feeling of anxiety and vexation instead of an agreeable consciousness of knowledge." The result in the student is nervous excitement and subsequent intellectual torpor,—conditions from which the young should be carefully guarded.

The Baden ministry published an outline of a decree, March 18, 1883, that had been prepared by the board of health, in conference with a number of teachers. Previous to this time, the different classes of the gymnasia had thirty, thirty-one, thirty-two, and thirty-four hours of study a week, without counting elective studies and gymnastics. These are now reduced to twenty-eight and thirty-two hours for the two groups of classes below and above the secunda. Before 1869 the total number of hours of study for a Baden gymnasium of nine classes was 269 a week, in 1869 it was raised to 286, and it is now 268. Each study-hour is limited to fifty minutes. The amount of home-study is also definitely fixed, and the course of instruction modified somewhat. As an evidence of the necessity of these changes, Professor Baumeister points out that in the lowest class of a gymnasium 1,300 Latin words have to be learned the first quarter of the year, and nearly as many the second, making a daily average of about twenty words. These words, he observes, are not met with in any authors read by the boys till they reach the upper classes, and are generally expressions of ancient life, of which a nine-year old boy knows nothing. The intellectual effort required to memorize these words, leads, he holds, to injurious and lasting effects.

The commission appointed by the stadtholder of Alsace Lorraine recommended that the number of study-hours should be restricted to twenty-six a week for the lowest classes of the gymnasia, and to twenty-eight and thirty-two for the higher; that the hours of home-study should be eight, twelve, and eighteen a week, progressing from the lowest class to the highest; and that six hours a week should be devoted to general physical exercise, including swimming, open-air sports, skating, and excursions. While the existing conditions will be somewhat ameliorated by these decrees, they do not seem to have brought about a final solution of the difficulty. Last year a petition upon the subject, signed by eminent teachers, physicians, and other citizens, was addressed to the Prussian chamber of deputies. After setting forth the deplorable effects of the excessive strain upon the nervous system of scholars, it appealed to the patriotism of the deputies to put an end to the abuse which, the petition asserts, "threatens little by little to reduce the cultivated classes of society to a state of moral weakness that shall render them incapable of great and manly resolution."

A PROPOSED NEW DEPARTURE IN HYGROMETRY.

IN the *Comptes rendus* for June 30, Mr. Jamin, the newly elected perpetual secretary of the French Académie des sciences, proposes a new departure in hygrometry.

The present system of expressing the amount of vapor of water in the atmosphere is to give the ratio $\frac{f}{F}$, of the observed elastic force f, to the maximum F, which the vapor would have at the same temperature if the atmosphere were saturated with it, i.e., were at the dew-point; and this is called the 'relative humidity.' Now, as this maximum F for the point of saturation does not by any means correspond to a constant ratio between the mass of the vapor of water in the air and the mass of its other constituents, but varies largely with the temperature, so that cold air will not hold nearly so much vapor of water as warm air, this system of expressing the amount of this vapor as a percentage of another percentage which is itself very variable, is, in the opinion of Mr. Jamin, a vicious one, at least for many purposes of meteorology.

In its stead he proposes to substitute just what a chemical analysis of the air in question would give; viz., its 'hygrometric richness' as given by the ratio of the amount of vapor of water to that of the other constituents, and as expressed in *volume* by the fraction $\frac{f}{H-f}$, or in *mass* by $0.622\frac{f}{H-f}$, in which H is the total pressure of the atmosphere, and the denominator consequently denotes that of dry air, or of all the other constituents but water-vapor.

Since observation does not give directly the relative humidity, but this is derived from an auxiliary table, Mr. Jamin shows that a table can be constructed which will just as readily give the hygrometric richness, for which he proposes to adopt the volume-measure $\frac{f}{H-f}$; and he states that such a table will hereafter be published in the *Annales du bureau central météorologique.*

While the present system has its advantages in showing approximately the nearness to the dew-point, and hence to cloud-formation and possible fall of rain or snow, yet it would seem, that for the wider study of total rainfall and evaporation, in fact of the general diurnal and annual circulation of water between

earth and sky, the proposed plan of Mr. Jamin is the only logical one; and it deserves, and, coming from such a source, will no doubt receive, the thorough consideration of meteorologists. H. M. PAUL.

Washington, July 22.

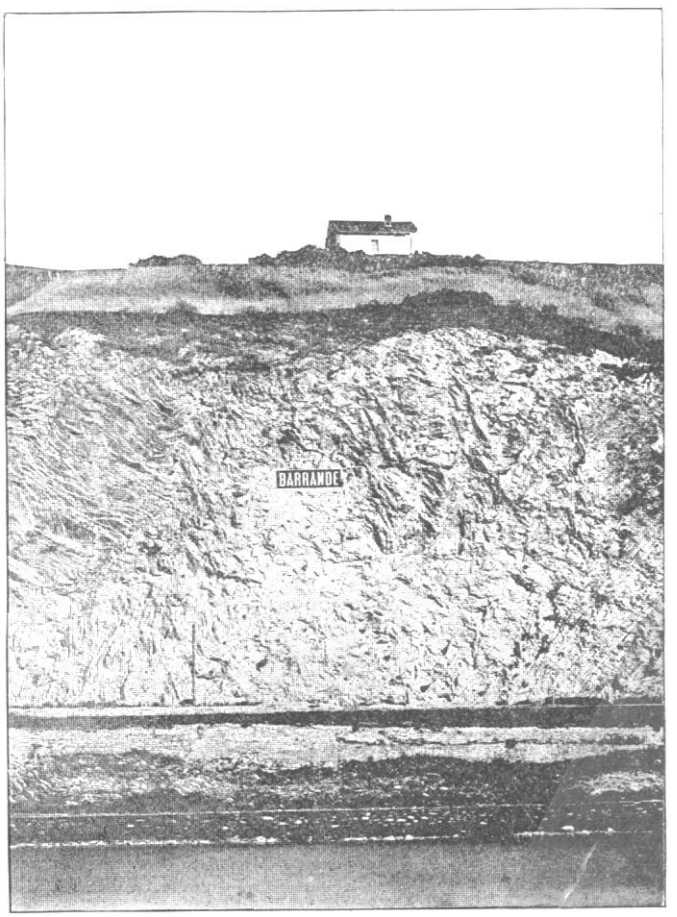
INDIAN LANGUAGES OF SOUTH AMERICA.

THE Indian languages of South America certainly deserve to be investigated as thoroughly as any other languages of the globe; but, unfortunately, there are only a few men who make of them an object of research. Abstracts of their grammatic elements have been published, from earlier sources chiefly, by Professor Friedr. Müller in his 'Grundzüge der sprachwissenschaft,' and by Lucien Adam in his 'Examen grammatical de seize langues Américaines' (Paris, 1882). The following treatises, published of late, have come to our notice, and have added considerably to our knowledge of these curious forms of human speech: 1°. Dr. Julius Platzmann's 'Glossar der feuerländischen sprache.' This is an attempt to present the Yahgan dialect of the Fuegian Islands in lexical form, and is chiefly based upon a Fuegian translation of the Gospel of St. Luke. It is preceded by four historical and topographical articles, composed by Dr. Karl Whistling, enlarging upon physical peculiarities of these islands. 2°. The first results of a scientific exploration of the Fuegian Islands by Bove, aided by the government of Italy, have been made public by Giacomo Bove, in his 'I Fuegini, secondo l'ultimo suo viaggio' (Parte prima, Genova, 1883). Extensive vocabularies of the language are published in this volume. 3°. A manuscript of 1818, by John Luccok, containing grammatical elements and a vocabulary of the Tupi language or lingoa geral of Brazil, was published at Rio de Janeiro by H. Laemmert & Co., 1882. Curiously enough, the titlepage contains the statement that the material is 'badly arranged.' 4°. Dr. Julius Platzmann's facsimile edition of Havestadt's book on Chilidúgu, which has been previously referred to in *Science*, iii. 550. 5°. A short ethnographic and linguistic article on the Indians of Antioquia and of the Cauca valley, Columbian Union, was published by R. B. White, F. G. S., in the *Journal of the anthropological institute of Great Britain and Ireland*, 1884. It contains vocabularies of the Noánama and Tadó dialects of the Chocó linguistic family. 6°. In the form of vocabularies of about two hundred terms each, seven Bolivian languages are given by Dr. Edwin R. Heath in the April number (1883) of the *Kansas city review*. These languages are the Canichána, Cayuába, Mobíma, Moseténa, Pacavára, Marópa, and Tacána. The author has given a graphic account of his travels through that deserted and malarial country in the *Transactions of the American geographical society of New York*, 1883. 7°. The foreign and Indian words introduced into the Portuguese of Brazil were collected by Braz da Costa Rabim in the *Rivista trimensal* of Rio Janeiro, vol. xlv., under the title 'Vocabulos indigenas e outros introduzidos no uzo vulgar.' 8°. An array of notices of former travellers upon the Aimorés has been gathered by A. H. Keane, professor at the London university, partly anthropological, partly ethnographical, with a short linguistic appendix, and published with his own remarks in the *Journal of the anthropological institute*, November, 1883 (15 pages, 8°), under the superscription 'On the Botocudos.' The tribal name, Aimorés ('vagrant enemies'), is preferable to and much older than Botocudos ('the ones wearing the lip-ornament'), which applies to many other South-American tribes just as well. Another name, the one by which they call themselves, is Nkrä'kmun (or 'men, people').

THE NEW BOGOSLOFF VOLCANO.

THE Grewingk or New Bogosloff volcano, described in *Science* (Jan. 25, 1884) from observations made last fall by Capts. Hague and Anderson, was visited by the revenue-cutter Thomas Corwin on the 20th of last May. Photographs and reports have been received at the treasury department which add considerably to our knowledge of its condition. It appears that the two peaks are united by a low dry spit, or bar, of sand and gravel which has doubtless been thrown up by the sea; and Ship Rock now rises from this bar nearly midway between the two peaks. Ship Rock, which is a nearly perpendicular pillar, seems, from the position of the barnacles on its base, to have been raised about twenty feet above its old level. The Bogosloff peak seems to have suffered by the commotion attending the eruption, as the Corwin party estimates its height to be about five hundred feet, while observations in 1873 by the U. S. coast survey gave it a height of over eight hundred feet, the upper third of which was composed of extremely acute, inaccessible pinnacles. As this determination was dependent upon a base-line measured by a patent log, which might have been put considerably in error by currents, too much dependence must not be placed on the discrepancy; nevertheless, as older observations all gave a greater height still, it is probable that a considerable change has taken place, if the Corwin's estimate be correct. The Grewingk cone was stated to be eight hundred or a thousand feet in height, and three-quarters of a mile in diameter, by Capt. Hague. It is now reported to be nearly the same height as the Bogosloff peak, or some four hundred and fifty feet in height and half a mile in diameter. Until the details of the survey are received, no exact figures can be given. A convenient landing-place is formed by the bight on either side of the sand-spit above mentioned, where the shore is also bold, there being three fathoms under the stern, with the boat's head on the beach. Farther off, the soundings are regular for a short distance, and then drop to a considerable depth; north from the Grewingk peak, however, no bottom could be found close in with ninety fathoms of line. The observations for position do not seem to have been very good, owing to cloudy weather, but showed a close correspondence with earlier determinations.

The summit of Grewingk was generally invisible from the clouds of steam which issued from many points of its surface, but no crater seems to exist. A sort of fissure existed in the south-west side, and two or three different pinnacles could be seen at the top when the wind drifted the steam away for a moment. Some of the jets of vapor were steady, others intermittent. No noise accompanied the ejection of steam. The cone is composed of very different materials, most of which seem to have been upheaved from the sea-bottom; such as large bowlders, blocks of sandstone, small pieces of shale, etc., all more or less covered with sand and fine pumice-ashes, into which one sank to the depth of a foot or more in attempting the ascent. No lava was seen, nor any cindery rock. The ascent was checked by the heat of the ashes, and the clouds of sulphurous steam, at a height of about two hundred feet. The stones about the jets exhibited incrustations of iron and sulphur; the latter forming large dendritic masses of a greenish color, which, at a little distance, looked like vegetation. The north-east slope of the cone was steeper than the south-western one, but more regular.



The Bogosloff peak was alive with sea-fowl and sea-lions, but was destitute of vegetation. It showed no signs of volcanic activity. The volcanic ash exactly resembled that which fell at Unalashka Oct. 20, 1883, and the latter doubtless came from Bogosloff Island. The island, in its new form, is about a mile and a quarter in length, and half a mile in extreme width, trending north-west and south-east by compass. The Corwin will visit it again on her return from the north in the autumn.

NOTES AND NEWS.

THE editor has received an acknowledgment from Dr. Anton Fritsch of the money forwarded to him, as already announced in *Science*, on behalf of American geologists toward a memorial tablet to Barrande. This tablet has been erected, at a cost of more than six hundred florins (of which 175.60 were sent from America), on a cliff at Kuchelbad, and is represented in the accompanying illustration from a photograph sent by him. Dr. Fritsch returns his best thanks to the American donors in the name of the natural-history section of the Prague museum, and says that the publication of this proof of sympathy has made a deep impression upon his countrymen. The list of American subscribers was printed in *Vesmír* for July 1. From the same paper we learn that the Barrande fund for researches in the Silurian formation of Bohemia has reached 4,200 florins.

— Among the names of our scientific friends in Great Britain who have been mentioned as intending to visit America for the meetings of the British and American associations, we find the following: Professor Adams, Mr. John Ball, Professor Robert Ball, Mr. C. S. Bate, Mr. R. M. Barrington, Prof. H. C. Bastian, Mr. A. W. Bennett, Mr. W. T. Blanford, Professor Bonney, Miss A. Buckland, Mr. W. L. Carpenter, Mr. W. Carruthers, Professor George Darwin, Mr. G. E. Dobson, Professor James Geikie, Mr. J. Glaisher, Professor Haddon, Mr. E. de Hamel, Dr. G. Harley, Professor Lawson, Sir John Lubbock, Professor MacKendrick, Professor MacNab, Professor Milnes Marshall, Professor Moseley, Lord Rayleigh, Sir E. Roscoe, Sir E. Ommanney, Mr. H. Saunders,

Mr. P. L. Sclater, Mr. A. Sedgwick, Mr. H. Seebohm, Mr. T. W. Sorby, Sir William Thomson, and Dr. E. S. Tylor.

— The National electrical commission met in Philadelphia on Aug. 7. It was decided that the conference to be conducted by the commission will be called for Monday, Sept. 8, to be then continued from day to day, as may be found necessary. The invitations to the conference will be confined to physicists of eminence, and to experts in the practical management of electrical appliances and apparatus. It is proposed to extend special invitations to prominent foreign visiting electricians. It was also decided to issue a circular inviting the conferees to submit papers to be read before the conference.

It is not definitely known what subjects will be discussed at the conference, but the following matters have been suggested: the sources of electrical energy; the theoretical conditions necessary to the most efficient construction of the dynamo-electric machine for the various purposes of practical work; the electrical transmission of energy; the systems of arc and incandescent lighting; the theory of the electric arc, storage batteries, electro-metallurgy; lighthouses for the coast; applications of electricity to military and mining engineering; lightning protection; induction in telephone lines, and the problem of long-distance telephoning; the question of underground wires; atmospheric electricity; earth-currents and terrestrial magnetism; photometry and standards for photometric measurements; the ratio of the electromagnetic to the electro-static system of units, and the electro-magnetic theory of light; and finally, on account of the pressing necessity for accurate and uniform electrical measurements, it is probable that the question of establishing a National bureau of physical standards will receive proper attention.

— The circulars concerning the proposed international scientific congress, to which reference was made in No. 77, have been issued; and the names of the signers received up to Aug. 4 are: of the special committee on the part of the American association, T. Sterry Hunt, S. Newcomb; officers of the association, George F. Barker, F. W. Putnam, Edw. D. Cope, John W. Langley, William H. Holmes, G. W. Hough, Franklin B. Hough, Alfred Springer, Theodore G. Wormley; fellows of the association, Cleveland Abbe, Harrison Allen, William Whitman Bailey, Albert S. Bickmore, Francis Blake, Thos. T. Bouvé, H. P. Bowditch, Edw. Burgess, Lucien Carr, F. W. Clarke, A. J. Cook, W. O. Crosby, Charles R. Cross, William H. Dall, Persifor Frazer, G. Brown Goode, Asaph Hall, C. E. Hanaman, William Harkness, Edwin J. Houston, Alpheus Hyatt, B. Joy Jeffries, Gaetano Lanza, Albert R. Leeds, H. Carvill Lewis, J. A. Lintner, Garrick Mallery, W. J. McGee, C. S. Minot, Charles E. Munroe, John M. Ordway, Henry F. Osborn, Edward C. Pickering, J. W. Powell, Ira Remsen, Alfred P. Rockwell, S. H. Scudder, George M. Sternberg, P. R. Uhler, A. E. Verrill, George L. Vose, Francis A. Walker, Justin Winsor.

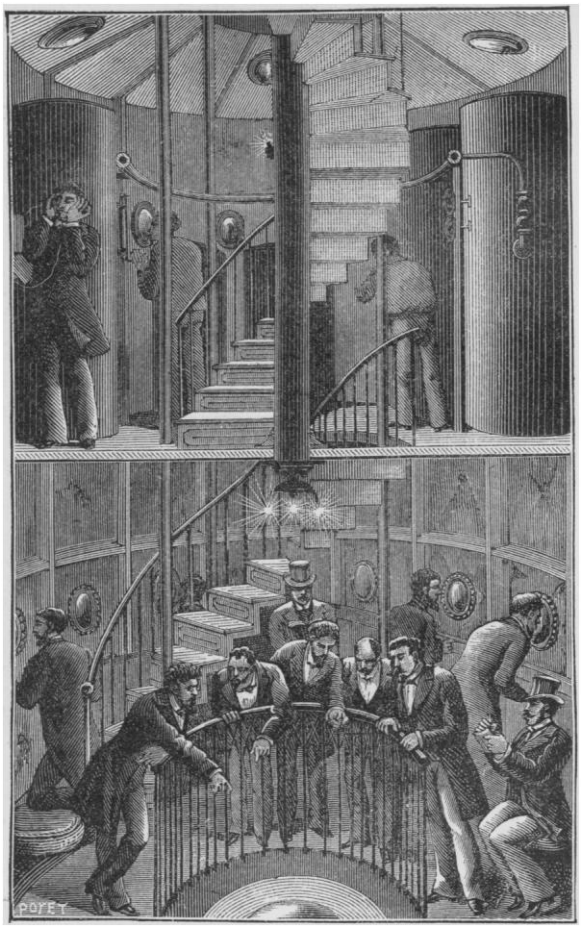
Probably some persons who have not received any circulars would be glad to support the movement; and we trust that any such will send their names to Dr. Minot. There has been some difficulty in reaching many persons during the vacation season; and it is known that omissions of certain addresses have unfortunately been unavoidable.

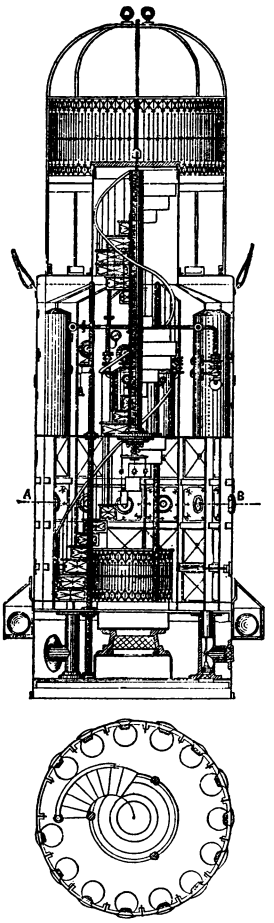
The support which the circular has received is remarkable for its extent and character, especially when its spontaneousness is considered. Most of the gentlemen upon the list given above are known as scientific investigators of acknowledged superiority, and many of them enjoy high fame; so that the plan of founding an international scientific congress meets the approval of a large proportion of those who contribute most to the dignity and importance of science in America.

— In response to an invitation sent out by the local committee of the American association for the advancement of science at Philadelphia, the following foreign scientific societies, among others, have sent the delegates mentioned to represent them at the approaching meeting in that city: Royal society, Professor Sir William Thomson, W. T. Blanford, H. W. Moseley; Royal institution, Professor James Dewar; Zoölogical society, P. L. Sclater (secretary), H. Saunders, G. E. Dobson; Royal microscopical society, Rev. W. H. Dallinger, A. W. Bennett, James Glaisher; Royal Irish academy, Prof. R. S. Ball; Royal geological society of Ireland, Professor Valentine Ball (president), Prof. W. J. Sollas; Royal Dublin society, Prof. A. C. Haddon, G. F. Fitzgerald; Royal zoölogical society of Ireland, H. M. Barton, W. E. Peebles, A. Trail; Philosophical society of Glasgow, H. Muirhead, James Mastear, Prof. J. G. McKendrick, W. C. Crawford, John Kirsop; Natural-history society of Glasgow, D. C. Glen; Royal botanical society, W. C. Crawford; Manchester literary and philosophical society, Prof. A. Milnes Marshall; Asiatic society of Bengal, Major J. Waterhouse of Calcutta; Asiatic society of Japan, Dr. D. Murray, Rev. E. W. Lyle, Perceval Lowell; Société anthropologique de Bruxelles, Dr. Victor Jacques (general secretary); Association Française pour l'avancement des sciences, Professor Joubert and Professor Silva; University of Japan (Tokio), Prof. D. Kikuchi (dean of department of science); Société entomologique de Belgique, Dr. H. A. Hagen; Ornithologischer verein in Wien, Dr. C. Hart Merriam; Royal society of Canada, a large number of delegates.

— At about five minutes past two, eastern time, on Sunday afternoon, Aug. 10, an earthquake-shock was felt along the eastern coast, from North Carolina to Maine. The direction of the motion of the wave appeared, to most who considered it, as from north to south, or north-west to south-east. The motion, as magnified at the top of the highest building in Boston, was sufficient to roll the signal-officer off his lounge. In New Jersey, where the shock was most severe, the railway-station at Seabright was shifted to one side, 'shaking up the contents.'

— The meeting this year of the German society of naturalists and physicians will be held at Magdeburg, Sept. 18–23.



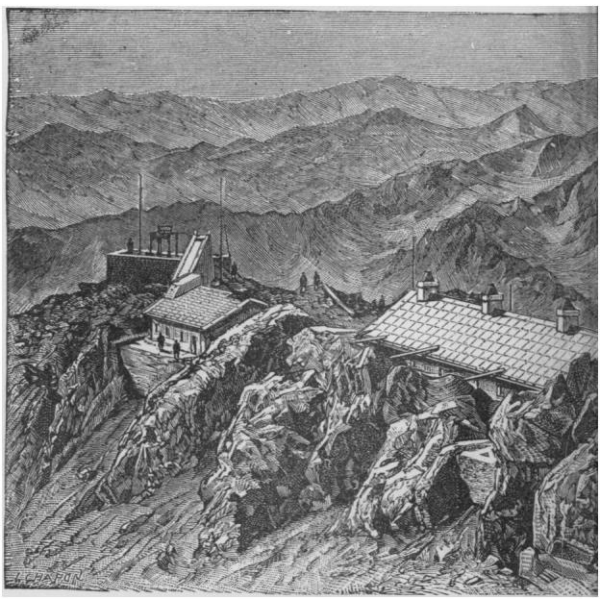


Section through A B.

A PROPOSED DIVING-CHAMBER SUPPLIED WITH COMPRESSED AIR TO BE USED IN SUBMARINE EXPLORATIONS. — *La Nature.*

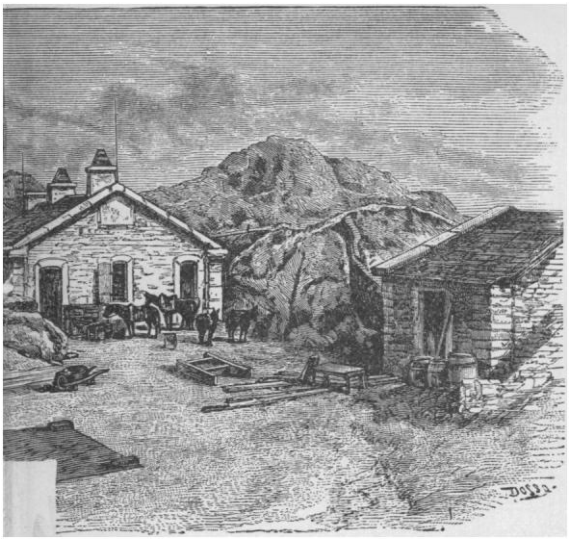
A PIECE OF ANCIENT PERUVI
La Nature.

THE LEAF-BUTTERFLY. FLYING AND ALIGHTED. — *Science monthly.*

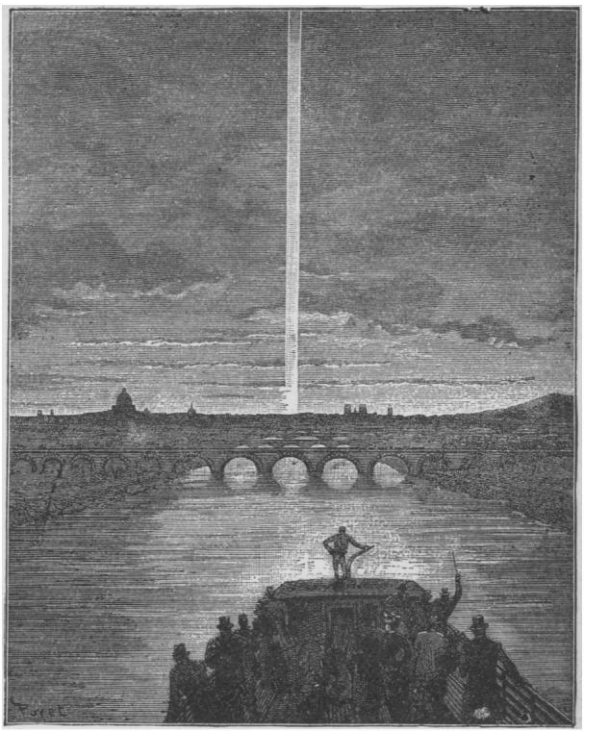


METEOROLOGICAL AND CHEMICAL LABORATORY ON PIC DU MIDI FOR ATMOSPHERIC PHENOMENA. — *Science et nature.*

SELECTED ILLUSTRATIONS FROM



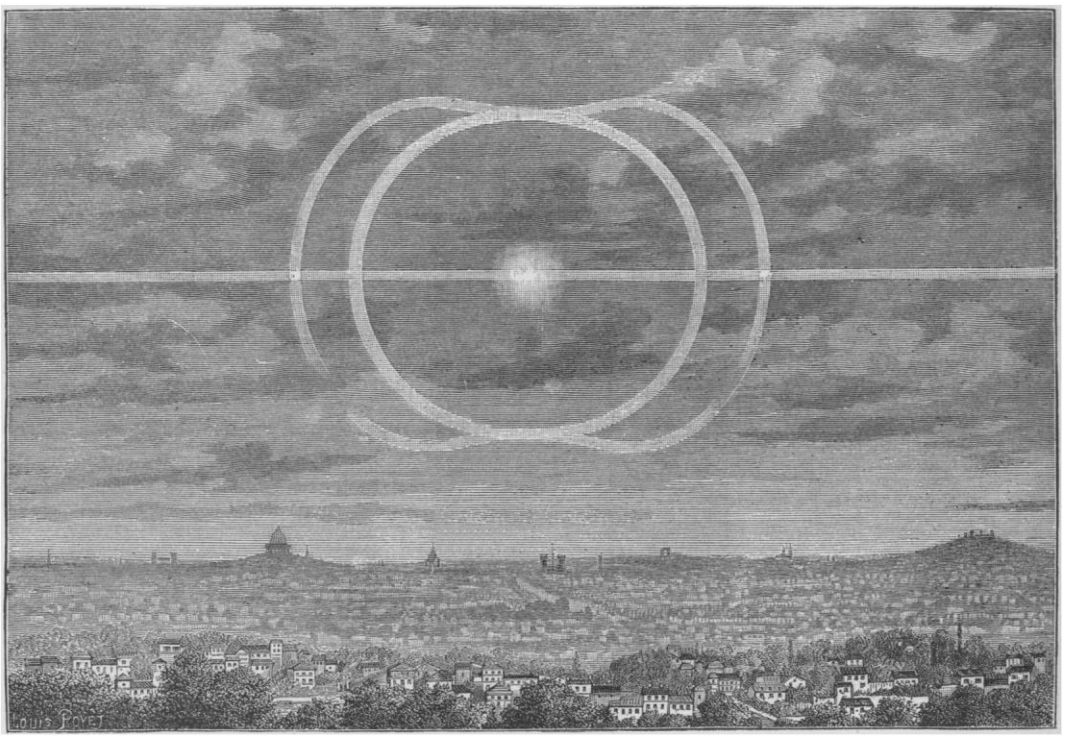
METEOROLOGICAL AND CHEMICAL LABORATORY ON PIC DU MIDI FOR THE STUDY OF ATMOSPHERIC PHENOMENA. THE SPECIAL LABORATORY OF MÜNTZ AND AUBIN FOR THE INVESTIGATION OF THE CHEMISTRY OF THE AIR. — *Science et nature.*



VERTICAL RAY SEEN FROM PARIS, MARCH 20, JUST AFTER SUNSET. — *L'Illustration.*

AN POTTERY. —

THE STUDY OF



HALO SEEN FROM THE OBSERVATORY OF THE PARC DE SAINT-MARC, MARCH 25, AT 11 A.M. — *L'Illustration.*